

### REMARKS

This responds to the Office Action mailed on January 22, 2004.

Claims 1-27 are now pending in this application.

#### §102 Rejection of the Claims

Claims 1-12, 14-20 and 25-27 were rejected under 35 USC § 102(b) as being anticipated by Nishikawa et al. ("A Method for Auto-Tuning of PID Control Parameters", Automatica, 20(3), 1984). This rejection is respectfully traversed.

Claim 1 recites: "calculating one or more new gains for the controller using a controller output signal, the process input control signal, and the target loop transfer function;" This language identifies a fundamental difference between the claimed invention and Nishikawa et al. In the currently claimed invention, the new gains are calculated based on comparing the actual response of the controller to a desired target response. As seen in FIG. 1, which clearly illustrates the language of claim 1, the controller output 22, control input signal 28, and the target loop transfer function are provided to the PID gain tuner 36 for providing new gains on line 38. In Nishikawa et al., "the response of the process output to a pulse input signal is sampled." Page 323. In other words, the present invention measures the response of the controller, while Nishikawa et al. measure the response of the process itself. This difference is clearly reflected in the claim language referencing the calculation of the new gains, and the rejection should be withdrawn.

The Examiner indicates that "Applicant intends the scope of 'towards a target loop transfer function' to include the use of a model, because otherwise claim 2 would not be further limiting." This is respectfully traversed. Claim 2 does not specifically refer back to the target loop transfer function. In particular, claim 2 recites: "The method of claim 1, wherein the one or more new gains for the controller are determined without using a model of the process." Since claim 1 contains the transitional phrase "comprising", it can cover a method having more elements than those recited. Further, claim 1 recites: "calculating one or more new gains for the controller using a controller output signal, the process input control signal, and the target loop transfer function;" There is no indication in claim 2 that "without using a model" applies to the

target loop transfer function or not. Thus, the language of claim 2 should not be used to specifically indicate that one particular element must have contained a model of the process.

The **target** loop transfer function does not model the process, but rather serves as a shape to which gains are fit, as indicated on page 11, lines 13-18. Note that it is not the actual transfer function implemented by the PID controller gain parameters. Nishikawa et al. uses a weighted integral of squared error as a performance index, as indicated in the abstract. Thus, it is not a target loop transfer function, as it is not a shape to which gains are fit.

The remaining claims contain similar recitations, and are believed patentable for at least the same reasons as claim 1.

Claims 1, 2, 7-11 and 25-27 were rejected under 35 USC § 102(b) as being anticipated by Wang et al. ("New Frequency-domain design method for PID controllers", IEEE Proc.-Control Theory Appl., 142(4), 1995). A prima facie case of anticipation has not been established and the rejection should be withdrawn. This rejection is respectfully traversed. Wang et al. lacks at least one element of each of the independent claims.

As mentioned above, claim 1 recites: "calculating one or more new gains for the controller using a controller output signal, the process input control signal, and the target loop transfer function;" The Examiner indicates that this language is found in Section 3.1 of Wang et al. This indication is respectfully traversed. Section 3.1 of Wang et al. has been reviewed, and there is no mention of calculating one or more new gains using all three of the controller output signal, the process input control signal and the target loop transfer function as claimed. Wang et al. appears to describe open and closed loop frequency responses that are functions of a time constant, a damping factor, a control signal and setpoints in equations 9 and 10, and then minimizes errors at several predetermined frequencies. Since the three claimed inputs to the calculation have not been pointed out, a prima facie case of anticipation has not been established, and the rejection should be withdrawn.

The remaining claims contain similar recitations, and are believed patentable for at least the same reasons as claim 1.

§103 Rejection of the Claims

Claim 13 was rejected under 35 USC § 103(a) as being obvious over Wang et al. in view of Stoddard et al. (U.S. Patent No. 5,895,596). Claim 13 is believed allowable for at least the same reasons as claim 1, and Stoddard et al. does not provide elements missing from Wang et al.

Claim 13 was rejected under 35 USC § 103(a) as being obvious over Wang et al. in view of Grassi et al. ("Proportional-Integral-Derivative Controller Tuning by Frequency Loop-Shaping", Ph.D dissertation, Arizona State University, 1999). Claim 13 is believed allowable for at least the same reasons as claim 1, and Grassi et al. does not provide elements missing from Wang et al.

Claim 14 was rejected under 35 USC § 103(a) as being obvious over Wang et al. in view of Ho et al. (U.S. Patent No. 5,587,899). Claim 14 is believed allowable for at least the same reasons as claim 1, and Ho et al. does not provide elements missing from Wang et al.

Claim 21 was rejected under 35 USC § 103(a) as being obvious over Wang et al. in view of Grassi et al. ("PID Controller Tuning by Frequency Loop-Shaping", Proc. 35th Conference on Decision and Control, Japan, 1996). Claim 21 is believed allowable for at least the same reasons as claim 1, and Grassi et al. does not provide elements missing from Wang et al.

Claims 22-24 were rejected under 35 USC § 103(a) as being obvious over Wang et al. in view of Grassi II and in further view of Nishikawa. Claims 22-24 are believed allowable for at least the same reasons as claim 1, and Grassi II does not provide elements missing from Wang et al.

**CONCLUSION**

Applicant respectfully submits that the claims are in condition for allowance and notification to that effect is earnestly requested. The Examiner is invited to telephone Applicant's attorney (612) 373-6972 to facilitate prosecution of this application.

If necessary, please charge any additional fees or credit overpayment to Deposit Account No. 19-0743.

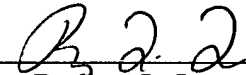
Respectfully submitted,

SUJIT V. GAIKWAD ET AL.

By their Representatives,

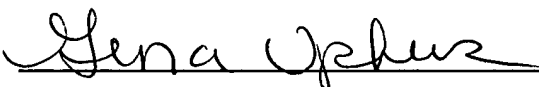
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Date March 22, 2004

By   
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